CLAIMS

WHAT IS CLAIMED IS:

1. A railway train friction management system for managing and controlling an application of a friction modifying agent to an area of contact between a railway wheel and a railway rail over which the wheel is traversing to selectively modify the coefficient of friction at the contact area, the system comprising:

a sensor for detecting a parameter relating to an operation of the railway train;

a controller responsive to the sensor for controlling the application of the friction modifying agent to the rail as a function of the parameter; and

an applicator responsive to the controller for applying the friction modifying agent to the area of contact between the railway wheel and rail.

2. The system of claim 1, further comprising a locomotive having a first end and a second end, one of which is a leading end and the other of which is a trailing end; wherein the applicator is positioned on the trailing end of the locomotive and applies the friction modifying agent to the rail to reduce the coefficient of friction at the contact area for reduced wear and rolling resistance.

3. The system of claim 1, wherein the applicator is positioned on a railway car traversing the railway rail and being moved by a locomotive along the railway rail such that the applicator applies the friction modifying agent to reduce the coefficient of friction at the contact area for reduced wear and rolling resistance.

4. The system of claim 1, wherein the friction modifier agent is one that increases the coefficient of friction at the contact area for enhanced adhesion.

5. The system of claim 1, wherein the friction modifier agent is one that decreases the coefficient of friction at the contact area for enhanced adhesion.

6. The system of claim 1, wherein the friction modifier agent is one that removes another friction modifier agent from the contact area.

7. The system of claim 4, wherein the friction modifier agent is one from a group of agents comprising sand, sand-like material, and air.

8. The system of claim 5, wherein the friction modifier agent is one from a group of agents comprising air, steam, water, lubricating fluid, and oil.

9. The system of claim 1, wherein the parameter is selected from the group of parameters comprising train speed, wheel speed, tractive effort (TE), throttle setting, acceleration, deceleration, braking condition, force, wheel slip/slide, fuel consumption, wheel creep, engine horsepower, and traction motor torque.

10. The system of claim 1, further comprising auxiliary data wherein the controller retrieves the auxiliary data and is responsive to the parameter and the auxiliary data for controlling the application of the friction modifying agent to the rail.

11. The system of claim 10, wherein the auxiliary data is selected from a group of auxiliary data comprising train length, train weight, track map, train location, track topography, track grade, track curvature, rail temperature, rail condition, current weather, forecast weather, train schedules, commands from operators, and commands from remote dispatch centers.

12. The system of claim 1, wherein the applicator is configured to apply the friction modifying agent to a defined point of a rail configuration and wherein the controller controls the application of the friction modifying agent to the defined point of rail configuration.

13. The system of claim 12, wherein the defined point of application is selected from a group of points of application comprising a wheel flange, a wheel rim, a top of the rail, and a rail gage side.

14. The system of claim 1, wherein the controller determines timing of the application of the friction modifying agent by the applicator.

15. The system of claim 1, wherein the controller determines quantity of the application of the friction modifying agent by the applicator.

16. A method for railway train friction management for managing and controlling an application of a friction modifying agent to an area of contact between a railway wheel of a railway train and a railway rail over which a wheel is traversing to selectively modify a coefficient of friction at the contact area, the method comprising:

sensing a parameter related to the operation of the railway train; and

applying the friction modifying agent to the area of contact between the railway wheel and rail as a function of the sensed parameter.

17. The method according to claim 16, further comprising determining the timing of applying the friction modifying agent and the quantity of friction modifying agent to be applied based on the sensed parameter, wherein the controlling is based on the determining of the timing and the quantity.

18. The method according to claim 16 wherein applying the friction modifying agent includes applying a friction enhancing agent to enhance the friction of a wheel of a locomotive and applying a friction reducing agent to the rail prior to a wheel of a connected railway car.

19. The method according to claim 16, further comprising controlling the application of a friction modifying agent to the rail responsive to the sensed parameter.

20. A railway train friction management system for managing and controlling the application of a friction modifying agent to an area of contact between a railway wheel of a railway train and a railway rail over which the wheel is traversing to selectively modify a coefficient of friction at the contact area, the system comprising:

a plurality of sensors for detecting parameters relating to an operation of the railway train;

at least one controller responsive to input from at least one of the plurality of sensors for controlling the application of the friction modifying agent to the rail as a function of at least one of the sensed parameters; and

a plurality of applicators responsive to at least one controller for applying the friction modifying agent to the area of contact between the railway wheel and rail.

21. The system of claim 20 including a train comprising a plurality of locomotives and a plurality of railway cars each having a plurality of railway wheels and at least some of the locomotives and/or railway cars having applicators thereon and wherein the at least one controller determines which applicators are to be operated to apply friction modifying agent to the area of contact between the railway wheel and rail.

22. The system of claim 21 further comprising each locomotive having a first end and a second end, one of which is a leading end and the other of which is a trailing end; wherein the applicators are positioned on either or both the leading end and the trailing end of at least some of the locomotives.

23. The system of claim 20 wherein the friction modifier agent is one that increases the coefficient of friction at the contact area for enhanced adhesion.

24. The system of claim 20 wherein the friction modifier agent is one that decreases the coefficient of friction at the contact area for enhanced adhesion.

25. The system of claim 20, wherein the friction modifier agent is one that removes another friction modifier agent from the contact area.

26. The system of claim 23, wherein the friction modifier agent is one from a group of agents comprising sand, sand-like material, and air.

27. The system of claim 24, wherein the friction modifier agent is one from a group of agents comprising air, steam, water, lubricating fluid, and oil.

28. The system of claim 20, wherein the at least one parameter is selected from the group of parameters comprising train speed, wheel speed, tractive effort (TE), throttle setting, acceleration, deceleration, braking condition, force, wheel slip/slide, fuel consumption, wheel creep, engine horsepower, and traction motor torque.

29. The system of claim 20, further comprising auxiliary data wherein the controller retrieves the auxiliary data and is responsive to at least one parameter and the auxiliary data for controlling the application of a friction modifying agent to the rail.

30. The system of claim 29, wherein the auxiliary data is selected from a group of auxiliary data comprising train length, train weight, track map, train location, track topography, track grade, track curvature, rail temperature, rail condition, current weather, forecast weather, train schedules, commands from operators, and commands from remote dispatch centers.

31. The system of claim 20, wherein the applicators are configured to apply the friction modifying agent to a defined point of a rail configuration and wherein the controller controls the application of the friction modifying agent to the defined point of rail configuration.

32. The system of claim 31, wherein the defined point of application is selected from a group of points of application comprising a wheel flange, a wheel rim, a top of the rail, and a rail gage side.

33. The system of claim 20, wherein the at least one controller determines timing of the application of the friction modifying agent by the applicators.

34. The system of claim 20, wherein the controller determines quantity of the application of the friction modifying agent by the applicators.

35. A method for railway train friction management for managing and controlling an application of a friction modifying agent to an area of contact between railway wheel of a railway train and railway rail over which the wheel is traversing to selectively modify the coefficient of friction at the contact area, the method comprising:

sensing at least one parameter related to an operation of the railway train; and

applying at least one friction modifying agent to a selected area of contact between the railway wheel and rail as a function of the at least one sensed parameter.

36. The method according to claim 35, further comprising determining the timing of applying the friction modifying agent based on the sensed parameter, wherein the controlling is based on the determining of the timing.

37. The method according to claim 35, further comprising determining the quantity of friction modifying agent to be applied based on the sensed parameter, wherein the controlling is based on the determining of the quantity.

38. The method according to claim 35, further comprising determining the timing of applying the friction modifying agent and the quantity of friction modifying agent to be applied based on the sensed parameter, wherein the controlling is based on the determining of the timing and the quantity.

39. The method according to claim 35, wherein the step of applying the at least one friction modifying agent includes applying a friction enhancing agent to enhance the friction of a wheel of a locomotive and applying a friction reducing agent to the rail prior to a wheel of a connected railway car.

40. The method according to claim 35, further comprising controlling the application of the friction modifying agent to the rail responsive to the at least one sensed parameter.

41. The method of claim 35 wherein the train includes a plurality of locomotives and a plurality of railway cars each having a plurality of railway wheels and one or more of the locomotives and/or railway cars have friction modifying applicators thereon and wherein the controlling of the friction modifying agent includes selecting which applicators are to be operated to apply friction modifying agent to the area of contact between the railway wheel and rail and then applying the friction modifying agent through operation of the selected applicators.

42. The method of claim 35 wherein the step of applying at least one friction modifying agent includes applying one that increases the coefficient of friction at the contact area.

43. The method of claim 35 wherein the step of applying at least one friction modifying agent includes applying one that decreases the coefficient of friction at the contact area.

44. The method of claim 35 wherein the step of applying at least one friction modifying agent includes applying one that removes another friction modifier agent from the contact area.

45. The method of claim 42 wherein the step of applying at least one friction modifying agent includes applying at least one selected from a group of agents comprising sand, sand-like material, and air.

46. The method of claim 10 wherein the step of applying at least one friction modifying agent includes applying at least one selected from a group of agents comprising air, steam, water, lubricating fluid, and oil.

47. The method of claim 35 wherein the step of selecting at least one parameter includes selecting from the group of parameters comprising train speed, wheel speed, tractive effort (TE), throttle setting, acceleration, deceleration, braking condition, force, wheel slip/slide, fuel consumption, wheel creep, engine horsepower, and traction motor torque.

48. The method of claim 35, further comprising the selection of auxiliary data and the applying of at least one modifying agent is a function of the auxiliary data and the at least one parameter.

49. The method of claim 48 wherein the auxiliary data is selected from a group of auxiliary data comprising train length, train weight, track map, train location, track topography, track grade, track curvature, rail temperature, rail condition, current weather, forecast weather, train schedules, commands from operators, and commands from remote dispatch centers.